

The background is a dark blue gradient with faint, light blue technical diagrams. These include circular gauges with tick marks and numbers (e.g., 160, 170, 180, 210, 220, 230, 240, 250, 260), dashed lines, and arrows. The overall aesthetic is technical and digital.

# HOW CAN YOU PREVENT STUDENTS FROM SEARCHING FOR HOMEWORK SOLUTIONS ON THE WEB?

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# IF YOU CAME FOR ALMA'S TALK – SORRY!

- Substituting for Alma Robinson (Virginia Tech) “Kitchen Cabinet Demos”
- She will give the talk at a future CSAAPT Meeting

## RECENT TREND : STUDYING = GOOGLE SEARCHES ?!!

- For many students, “to study” is synonymous with “do a Google search”
- “Solving a problem” = “finding the solution online” or “pay someone online to solve the problem for you”
- In the old days, physics students used to take pride in the fact that they did not have to memorize anything because they could solve any problem on the spot from basic principles 😊  
But today, many students think they do not have to memorize anything because they can always look it up on their smart phones 😞

# MANY STUDENTS DO NOT THINK IT IS WRONG 😞

- “Your homework problem was way too difficult! It took me two hours to find the solution on the web!”
- “ There must be something wrong with WebAssign. I paid Chegg tutors twice to solve your homework problem, but WebAssign marked it as incorrect both times.”
- Etc.

## WHY DO THEY DO IT?

- They cannot decipher what the (word) problems are asking
- They cannot do algebra using symbolic manipulations, so calculation are extremely painful
  - If the answer comes out wrong, they have no idea where they had made an (or multiple) error(s). The experience does not train them to do calculations correctly.
- They do not think they will learn anything from trying to solve the problems themselves
  - questions do not make any sense (to them)
  - calculations are just tedious
  - their peers (even instructors) encourage them to cheat

# HOW DO YOU PREVENT IT?

- Give away the solutions yourself in a controlled manner!
  - Provide diagrams that help students understand what is being asked
  - Encourage doing symbolic manipulations by showing all the intermediate steps
- Homework Help Files
  - Level 1 : explain how to interpret the problem, and set up equations
  - Level 2 : give details on how to solve the equations

## BENEFITS :

- Students will NOT waste their time and money on the web or Chegg! 😊
- Weaker students will not be paralyzed when confronted with a seemingly impossible problem 😊
- Stronger students will try to solve the problems without looking at the Homework Help Files in the beginning, and only look at them later to check their results or when they find the problem too challenging 😊
- Students who learned how to do symbolic manipulations are overjoyed!  
- This is a skill that will be useful even if they are not physics majors 😊
- No one comes to my office hours anymore 😊

## DRAWBACKS :

- No one comes to my office hours anymore ☹️
- Very time consuming to prepare the Homework Help Files ☹️
- You need to know LaTeX ☹️
- Software costs ☹️
  - Figures are created with Adobe Illustrator and Mathematica
- People using the same textbook should pool their resources and create Homework Help Files together! 😊
  - If you are using Giordano, contact me ([takeuchi@vt.edu](mailto:takeuchi@vt.edu))